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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/074,564	02/11/2002	Michael A. Todd	ASMEX.333A	6555

20995 7590 09/25/2003

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EXAMINER

KEBEDE, BROOK

ART UNIT

PAPER NUMBER

2823

DATE MAILED: 09/25/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/074,564

Applicant(s)


TODD ET AL.

Examiner

Brook Kebede

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 27 June 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-54 is/are pending in the application.
- 4a) Of the above claim(s) 47-54 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-46 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 4, 8.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

1. Applicants' election without traverse of Group I invention, i.e., claims 1-50 in Paper No. 9 is acknowledged. In addition, Applicants' further election without traverse of Species I, i.e., claims 1-46, in Paper No. 9 is acknowledged
2. Claim 51-54 withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected invention, there being no allowable generic or linking claim. Election was made **without** traverse in Paper No. 9. Furthermore, Claim 47-50 withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected species, there being no allowable generic or linking claim. Election was made **without** traverse in Paper No. 9.

Double Patenting

3. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

4. Claims 1-46 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claim 1-83 of copending Application No. 10/074,563. Although the conflicting claims are not identical, they are not patentably distinct from each other because the following reasons:

Re claims 1 and 27, the instant application claimed limitations are essentially claimed in the co-pending application, i.e., U.S. Application No. 10/074,563. The claims include providing a chamber contain a substrate having a surface roughness; introducing a gas comprising trisilane into a chamber; establishing trisilane chemical vapor deposition conditions in the chamber; and depositing a Si-containing film onto the substrate. Furthermore, the claimed film thickness range and the surface roughness is determined by the process condition. Since the claimed process conditions of the instant application and application 10/074,563 are similar the claimed film thickness range and the surface roughness within the claim scope of application 10/074,563

In addition, claims 2-26 and 28-46 of the instant application are also claimed in claims 1-83 of application 10/074,563.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6. Claims 1-5, 14, 20, 21, 27, 28, 30, 33-35, and 42 are rejected under 35 U.S.C. 102(b) as being anticipated by Ikoma et al., Growth of Si/3C-SiC/Si(100) hetrostructures by pulsed supersonic free jets, *Applied Physics Letters*, Volume 75, No. 25, Pp. 3977-3979, December 1999.

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Re claim 1, Ikoma et al. disclose a method for depositing a thin film, comprising: introducing a gas comprising trisilane to a chamber, wherein the chamber contains a substrate having a substrate surface roughness; establishing trisilane chemical vapor deposition conditions in the chamber; and depositing a Si containing film onto the substrate, the Si-containing film having a thickness in the range of 10 Å to 150 Å and a film surface roughness that is greater than the substrate surface roughness by an amount of about 5 Å rms or less, over a surface area of about one square micron or greater (see Pages 3977 – 3979)

Re claim 2, as applied to claim 1 above, Ikoma et al. disclose all the claimed limitations including the limitation wherein the Si-containing film is deposited as an amorphous film (see Pages 3977-3979).

Re claim 3, as applied to claim 1 above, Ikoma et al. disclose all the claimed limitations including the limitation wherein the Si-containing film is deposited as an epitaxial film (see Pages 3977-3979).

Re claim 4, as applied to claim 1 above, Ikoma et al. disclose all the claimed limitations including the limitation wherein the Si-containing film is deposited as a polycrystalline film (see Pages 3977-3979).

Re claim 5, as applied to claim 2 above, Ikoma et al. disclose all the claimed limitations including the limitation wherein the Si-containing film is deposited directly onto a non-single crystal material (see Pages 3977-3979).

Re claim 14, as applied to claim 2 above, Ikoma et al. disclose all the claimed limitations including the limitation wherein the Si-containing film has a thickness nonuniformity of about 10% or less for a mean film thickness in the range of 100 Å to 150 Å, a thickness non-uniformity

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of about 15% or less for a mean film thickness in the range of 50 Å to 99 Å, and a thickness non uniformity of about 20% or less for a mean film thickness of less than 50 Å (see Pages 3977-3979).

Re claim 20, as applied to claim 2 above, Ikoma et al. disclose all the claimed limitations including the limitation wherein establishing trisilane chemical vapor deposition conditions comprises heating the substrate to a temperature in the range of about 400°C to about 750°C in the absence of a plasma (see Pages 3977-3979).

Re claim 21, as applied to claim 1 above, Ikoma et al. disclose all the claimed limitations including the limitation wherein establishing trisilane chemical vapor deposition conditions comprises heating the substrate to a temperature in the range of about 450°C to about 650°C in the absence of a plasma (see Pages 3977-3979).

Re claim 27, Ikoma et al. disclose a method for depositing a thin film, comprising: introducing trisilane to a chamber, wherein the chamber contains a substrate; and depositing a continuous amorphous Si-containing film having a thickness of less than about 100 Å and a surface area of about one square micron or larger onto the substrate by thermal chemical vapor deposition (see Pages 3977-3979).

Re claim 28, as applied to claim 27 above, Ikoma et al. disclose all the claimed limitations including the limitation wherein the substrate comprises a non-single crystal material (see Pages 3977-3979).

Re claim 30, as applied to claim 27 above, Ikoma et al. disclose all the claimed limitations including the limitation wherein the Si-containing film has a surface roughness of about 5 Å or less (see Pages 3977-3979).

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Re claim 33, as applied to claim 27 above, Ikoma et al. disclose all the claimed limitations including the limitation wherein the depositing is conducted at a temperature in the range of about 450°C to about 650°C (see Pages 3977-3979).

Re claim 34, as applied to claim 27 above, Ikoma et al. disclose all the claimed limitations including the limitation wherein the depositing is conducted in or near a mass transport limited regime for trisilane (see Pages 3977-3979).

Re claim 35, as applied to claim 27 above, Ikoma et al. disclose all the claimed limitations including the limitation wherein the continuous amorphous Si-containing film has a surface area of about five square microns or larger (see Pages 3977-3979).

Re claim 42, as applied to claim 27 above, Ikoma et al. disclose all the claimed limitations including the limitation wherein the depositing is conducted at a temperature in the range of about 425°C to about 700°C (see Pages 3977-3979).

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later

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invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

8. Claims 6-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ikoma et al., Growth of Si/3C-SiC/Si(100) hetrostructures by pulsed supersonic free jets, *Applied Physics Letters*, Volume 75, No. 25, Pp. 3977-3979, December 1999 in view of Shields et al. (US/5,698,771).

Re claim 6, as applied to claim 2 above, Ikoma et al. disclose all the claimed limitation. However, Ikoma et al. do not specifically disclose depositing of the Si-containing film (i.e., SiC thin film) directly onto a dielectric material.

Shields et al. disclose depositing of Si-containing film (i.e., SiC film) (17) directly onto a dielectric material (16) (see Fig. 1) during formation a gate electrode.

Therefore, it would have been obvious to one having ordinary skill in the art at the time of applicant(s) claimed invention was made to have provided Ikoma et al. reference with dielectric material as taught by Shields et al. because the dielectric material would have utilized as gate insulating layer during fabrication of a gate electrode that comprises Si-containing film.

Re claim 7, as applied to claim 6 above, Ikoma et al. disclose all the claimed limitation. Furthermore, Shields et al. suggests that the dielectric material can be silicon oxide (see Col. 5, lines 19-25).

Re claim 8, as applied to claim 6 above, Ikoma et al. and Shields et al. in combination disclose all the claimed limitation. wherein the film surface roughness is about 3 Å rms or less.

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Re claim 7, as applied to claim 6 above, Ikoma et al. disclose all the claimed limitation. Furthermore, Shields et al. suggests that the dielectric material can be silicon oxide (see Col. 5, lines 19-25).

9. Claims 9 and 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ikoma et al., Growth of Si/3C-SiC/Si(100) hetrostructures by pulsed supersonic free jets, *Applied Physics Letters*, Volume 75, No. 25, Pp. 3977-3979, December 1999 in view of Okuno et al. (US/6,455,892).

Re claim 9, as applied to claim 2 above, Ikoma et al. disclose all the claimed limitation. However, Ikoma et al. do not specifically disclose depositing an oxide layer directly onto the Si-containing film.

Okuno et al. disclose depositing an oxide layer (7) (i.e., silicon oxide) directly onto the Si-containing film (i.e., SiC substrate) during formation a gate oxide film (see Fig. 1).

Therefore, it would have been obvious to one having ordinary skill in the art at the time of applicant(s) claimed invention was made to have provided Ikoma et al. reference depositing an oxide layer directly onto the Si-containing film as taught by Okuno et al. because the oxide would have utilized as gate insulating layer during fabrication the semiconductor device.

Re claim 36, as applied to claim 27 above, Ikoma et al. disclose all the claimed limitation. However, Ikoma et al. do not specifically disclose depositing an oxide layer directly onto the Si-containing film.

Okuno et al. disclose depositing an oxide layer (7) (i.e., silicon oxide) directly onto the Si-containing film (i.e., SiC substrate) during formation a gate oxide film (see Fig. 1).

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Therefore, it would have been obvious to one having ordinary skill in the art at the time of applicant(s) claimed invention was made to have provided Ikoma et al. reference depositing an oxide layer directly onto the Si-containing film as taught by Okuno et al. because the oxide would have utilized as gate insulating layer during fabrication the semiconductor device.

36. The method of Claim 27, further comprising depositing an oxide layer over the Si-containing film.

Allowable Subject Matter

10. Claims 10-19, 22-26, 31, 32, and 37-41, and 43-46 objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

11. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure Suzuki et al. (US/5,389,398), Yamamoto et al. (US/6,228,181), Ueda et al. (US/6,326,311), and Pomarede et al. (US/6,613,695) also disclose similar inventive subject matter.

Correspondence

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Brook Kebede whose telephone number is (703) 306-4511. The examiner can normally be reached on 8-5 Monday to Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri can be reached on (703) 306-2794. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

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Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

Brook Kebede

BK
September 5, 2003


Olik Chaudhuri
Supervisory Patent Examiner
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